

AMENDMENT TO THE CLAIMS:

This listing of the claims replaces all prior versions, and listings, of claims in the application.

1. (currently amended) A method for creating a multidimensional morphological reconstruction of biological tissue data characterizing a biological tissue ~~sample~~ comprising the steps of:

cutting histologically thin sections of said biological tissue sample to produce first and second sets of alternating serial ~~sample~~ sections of said biological tissue;

mapping image data obtained from the first set of alternating serial sections onto a tissue space coordinate system to constructing a multidimensional morphological tissue space spatial matrix of image data based on the first set of alternating serial sample sections;

incising a grid pattern across each serial section in the second set of alternating serial sections to create a set of incised section samples for each serial section of the second set of alternating serial sections;

associating each incised section sample incised from the second set of alternating serial sections with a unique set of indices to form a set of indexed incised section samples, with each unique set of indices indicating tissue space coordinates of each indexed incised section sample in the morphological tissue space matrix;

~~rasterizing the second set of alternating serial sample sections into a multidimensional spatial grid of indexed tissue samples, with indices of an indexed tissue sample indicating the location of the indexed tissue sample in the multidimensional spatial grid~~;

utilizing biological activity methods to analyze analyzing each indexed incised tissue section sample to obtain biological data providing information on a plurality of biological characteristics of characterizing the indexed incised tissue section sample; and

~~utilizing the indices of each tissue sample to link the biological data characterizing each indexed tissue sample to the location in the multidimensional morphological matrix of image data corresponding to the indices of the indexed tissue sample~~.

spatially mapping the biological data characterizing each indexed incised section sample, incised from the second set of alternating serial sections, onto the multidimensional morphological tissue space matrix, constructed from the first set of alternating serial sections, utilizing the indices of an indexed incised section sample to superimpose the biological data of the

indexed incised section sample upon volume image data correlated to the indices associated with the indexed incised section sample.

2. (currently amended) The method of claim 1 where said step of utilizing biological activity methods to analyze ~~analyzing~~ comprises the act of:

analyzing the tissue sample utilizing a monoclonal antibody binding to determine levels of proteins and other ligands.

3. (currently amended) The method of claim 1 where said step of utilizing biological activity methods to analyze ~~analyzing~~ comprises the act of:

analyzing the tissue sample utilizing a micro array to determine levels of mRNA.

4. (currently amended) A method for creating a multidimensional morphological reconstruction of gene expression activity in a biological tissue sample comprising the steps of:

cutting histologically thin sections of said sample to produce first and second sets of alternating serial sample sections;

histologically-staining and coverslipping said first set of serial sample sections for light microscopy;

utilizing the first set of histologically-stained serial sample sections to construct a multidimensional morphological spatial matrix of image data;

mounting and covering the second set of serial sample sections with a micro dissection membrane;

incising a grid pattern across each of the second set of serial sample sections to form a plurality of incised grid element sections on each serial sample section;

providing a set of indexed grid element holders with indices ~~indexes~~ indicating the identity of the serial sample section from which the grid element is incised and coordinate indices indicating the location of the grid sample element in the identified serial sample section;

transferring each incised grid element to the corresponding indexed grid element holder so that the indexed grid element holders form a spatial array preserving the location of the grid elements in the tissue sample;

analyzing each grid element to obtain biological gene expression data;
utilizing the index data to spatially superimpose gene expression data of each grid element onto the multidimensional morphological matrix of image data.

5. (cancelled)

6. (currently amended) The method of claim 5 ~~4~~ further comprising the step of:
generating displays correlating values of biological data with corresponding locations in the 3-D (three-dimensional) visualization.

7. (currently amended) A method for creating a multidimensional morphological reconstruction of biological data characterizing a ~~first~~ biological tissue sample comprising the steps of:

cutting histologically thin sections of said biological tissue sample to form a set of serial sample sections;

constructing a multidimensional morphological spatial matrix of image data based on the set of serial sample sections of said first biological tissue sample;

incising a grid pattern across each serial section of ~~rasterizing tissue from~~ said first biological tissue sample to form ~~into~~ a multidimensional spatial grid of indexed incised section samples ~~tissue sub-samples~~, with indices of an indexed incised section sample ~~tissue sub-sample~~ indicating the location of the indexed incised section sample ~~tissue sub-sample~~ in the multidimensional spatial grid;

analyzing each indexed incised section sample ~~tissue sub-sample~~ to obtain biological data characterizing the indexed incised section sample ~~tissue sub-sample~~; and

utilizing the indices of each indexed incised section sample ~~tissue sub-sample~~ to link the biological data characterizing each indexed incised section sample ~~tissue sub-sample~~ to the location in the multidimensional morphological matrix of image data corresponding to the indices of the indexed incised section ~~first biological tissue~~ sample.

8. (cancelled)

9. (currently amended) The method of claim 7 where ~~said rasterizing step comprises the step of:~~

~~creating a set of tissue sub-samples where each incised section sample tissue subsample corresponds to a specific multidimensional volume image data pixel from the multidimensional morphological spatial matrix of image data based on said first biological tissue sample, and where each such incised section sample sub-sample contains all of the tissue used to produce said volume image data pixel.~~

10. (currently amended) The method of claim 7 where ~~said rasterizing step comprises:~~

~~creating a set of tissue sub-samples where each indexed incised section sample tissue subsample corresponds, either directly or indirectly, to a specific range of multidimensional volume image data pixels from the multidimensional morphological spatial matrix of image data based on said first biological tissue sample.~~

11. (currently amended) A system for creating a multidimensional morphological reconstruction of biological data characterizing a first biological tissue sample comprising:

means for cutting histologically thin sections of said biological tissue sample to form a set of serial sample sections;

means for constructing a multidimensional morphological spatial matrix of image data based on the set of serial sample sections of said first biological tissue sample;

means for incising a grid pattern across each serial section of rasterizing tissue from said first biological tissue sample to form into a multidimensional spatial grid of indexed incised section samples tissue sub-samples, with indices of an indexed incised section sample tissue sub-sample indicating the location of the indexed incised section sample tissue sub-sample in the multidimensional spatial grid;

means for analyzing each indexed incised section sample tissue sub-sample to obtain biological data characterizing the indexed incised section sample tissue sub-sample; and

means for utilizing the indices of each indexed incised section sample tissue sub-sample to link the biological data characterizing each indexed incised section sample tissue sub-sample to the location in the multidimensional morphological matrix of image data corresponding to the indices of the indexed incised section first biological tissue sample.